

Experiential-centred Research Skills Development: getting engineers to understand the people in the problem

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Course profile

- Production operations and Engineering management MSc
- Run in the AME
- All modules have a major element of hands on experience
- As part of the course students need to undertake an industrial based project investigating a real industrial problem



INSTITUTE
FOR ADVANCED
MANUFACTURING
AND ENGINEERING

A UNIPART & COVENTRY UNIVERSITY COLLABORATION



Student profile

- 100% of the students hold an engineering core first degree.
- 83% of the students on the module are international students.
- The usual learning approach is lectures and workshop.
- Students were assessed by exams
- Engineering knowledge, theories and fundamentals
- Statistical analysis knowledge

Where is the Gap?

Research Experience and Skills

- experience on individual projects or conducting critical literature review

No. I have presented a seminar on a topic related to 'Working of Anti-Brake System' for automotive vehicles

I have done projects but not individually. Usually there will be at least team of three students to do a project

- experience on qualitative, quantitative or analytical analysis

No. I have not study

To be open, I have not even heard about this type of research before. Only after attending this module in Coventry University, I understood the importance of this research type

Yes, I have done qualitative and quantitative research

Issues with teaching research modules

- Issues with abstract nature of delivery. How to make the module relevant to their course and professional future, develop professional skills through real industrial experience (Earley, 2014; Murnoten 2005)

How research methods modules are done

- As separate module
- Include some elements of research methods in different modules
- Each have pros and cons

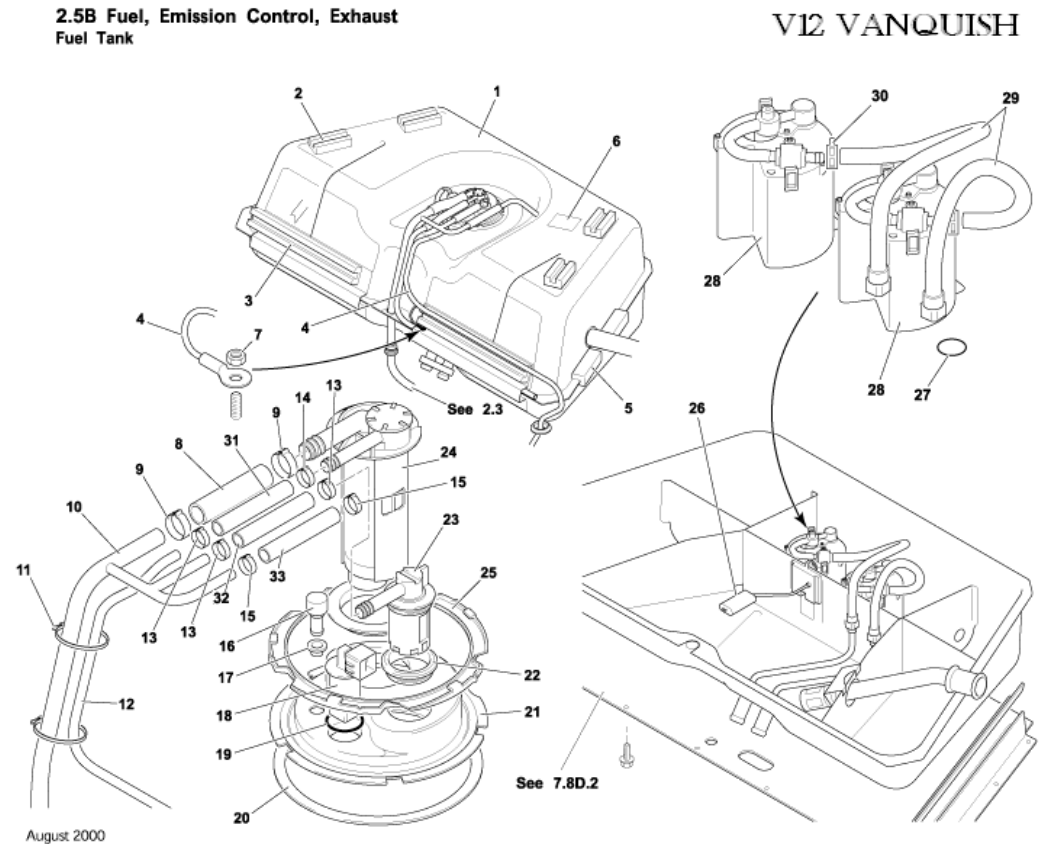
The Module Aim

- Engage the learner with real research and encourage reflection on research practice that **promotes professional development** and developing professional skills
- Inspire the student to lead their learning journey, and **Develop their ability to lead their own research**

Promotes Professional Development

Students develop professional skills through real industrial experience

- Andy Hind an experienced automotive engineer from Unipart, introduced the problem
- Provided data
- Visit to the shop floor
- Access to data and to observe and interact with employees



Students' Feedback

- Did the module content and skills developed supported your professional career? How? Please give examples?

During study of the research module presentations were held once in every week. With this our presentation skills, interaction with audience, possibility for further investigation etc were improved. The skills developed from this built my confidence

I am currently using all the tools which were taught in this module such as presentation skills, data collection techniques, interpretation of data available in the company, project management.

Since I am working in pure technical area in Aerospace, I didn't get a chance to use this for me. But I usually help my team leaders and Project Managers all the contents of this module.

This module will definitely help me in my professional career. At my work I will soon be carrying out Root cause analysis in one project to help my company to eliminate quality issues and to increase productivity of our manufacturing operations

Students' Feedback

- Can you see the link between the research methods module and your course of study? Any relevance? How?

The research methods module was very helpful in the course of study. The significance of this module is that it gives a clear approach to any research conducted by individuals on a specific topic

Yes of course it was related to my study. According to me, Engineering is just not only learning about technology but we should also learn how to do a project and how to follow the procedures to be successful in our project.

It helps the students to do their assignments methodically and also develops their soft skills such as Team-work, Communication and Presentation. It is very helpful for the students who are not used to do course works.

This module provides new students with skills to do their course works of other modules. The reason being that this module helps the student to develop critical approach towards any type of assignment and drives the student to brainstorm ideas and solutions.

Students Leading Research Activities

Pre-class

- Develop research knowledge through
- Students work in small group to investigate a real industrial problem
- conduct engineering analysis using quantitative, qualitative and analytical methods

LEARNING SUPPORT MATERIAL

 [Problem Solving Presentation](#)

 [A3 Introduction](#)


Video introducing A3 concept - use this to prepare your first formative presentation.

 [A3 Report Example](#)


A case study example using A3 Report

 [Critical Reading and Review](#)

This video provides a basic overview of the literature review process. It focuses on critical reading, writing and organizing the reviewed literature. It complements the other screencast video.

 [Critical Reading to Literature Review](#)


This video looks at how to move from reading of literature towards literature review - this complements the other screencast video.

 [Academic writing video](#)


This video provides guidance on academic writing

 [Research Design video](#)

This video discusses a high-level but important aspect around research design

 [Research methods](#)

This videos links from research philosophy and looks more closely at research methods.

 [Bloom's Taxonomy verbs](#)

Bloom's taxonomy is one way in which cognitive levels are determined. understanding these for your written work (in terms of what to show) as well as how to express yourself using appropriate vocabulary is really important, particularly around research aim and objectives.

Students Leading Research Activities

In classroom activity

- To present their findings Encourage discussion and reflection
- Provide feedback and establish the next step going forward
- Organise and share tasks

Students' feedback on the Video Materials

Would prefer a class room approach with small exercises to apply them rather than a video. However, this is a personal choice

Dr Christopher Smith video was really good and was really helpful.

Yes I liked the way this module was presented through videos.

Do not remember.

What was the balance of leadership between the lecturing team and you?

There was a good balance between lecturing team and students. The interaction on weekly basis helped you to go deep in the topic. Once discussion for the week was over it was our responsibility to prepare for the upcoming week

Personally, would prefer a traditional form of a classroom lecture led approach because of the short time span of the module. If this was conducted across 2 semesters then it is ok to follow the non-traditional approach.

The balance of leadership was good and we were always given productive feedback by our lecturers on our work and presentation in that particular session

Again, time was the main issue here. This module needs to split over 2 semesters. 1st half understanding the research techniques and second half concentrating on the industrial problem

Did you find the classroom sessions engaging?

Yes the classroom sessions were engaging with presentation, discussion and reflection.

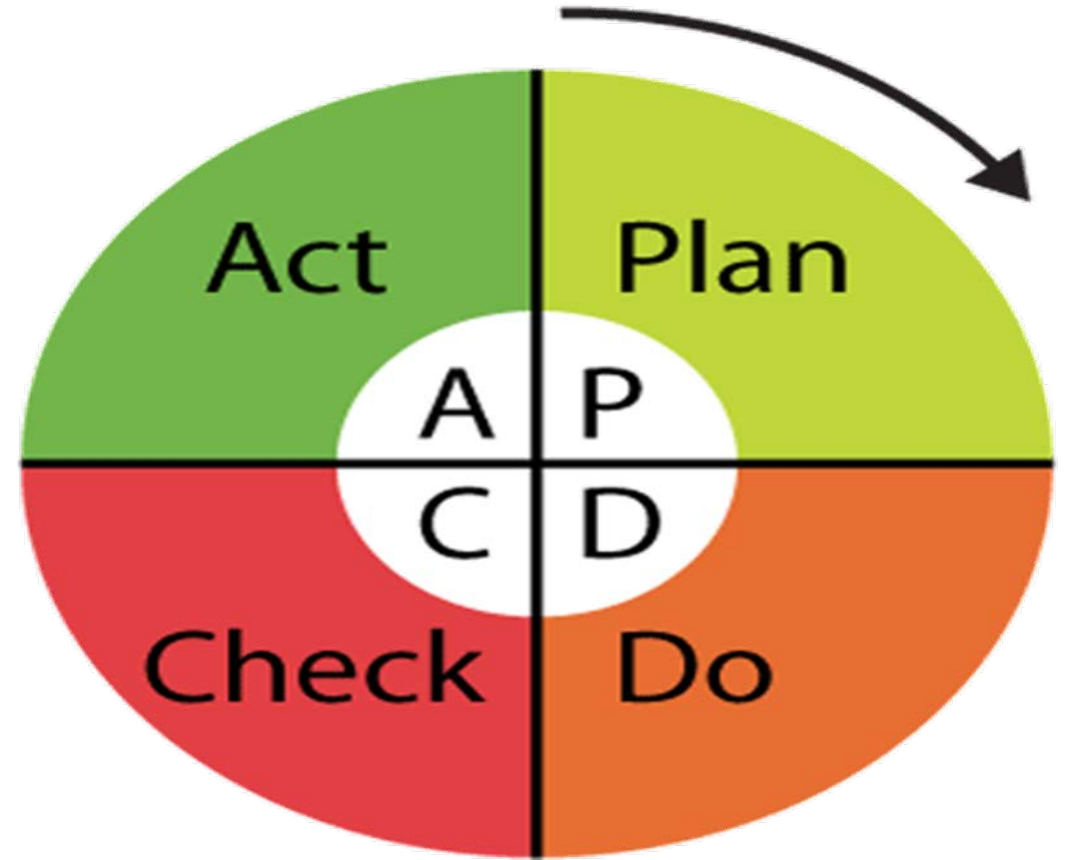
Yes, it was very good. Especially when we were giving presentations every week and getting feedback on the presentations.

These types of modules should be in a practical manner. For example, if the team does literature review sample, the tutors can discuss about that and correct the mistakes they did, something like trial and error method. Dr Chris and his team really did well by keeping us engaged in a practical manner which was not at all boring.

It was satisfactory.

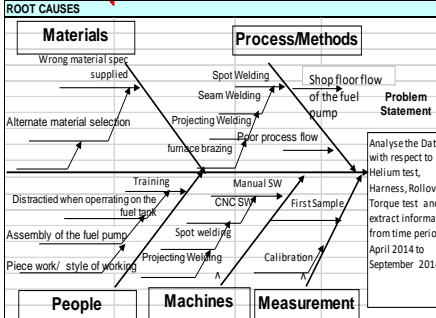
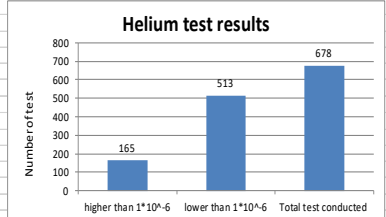
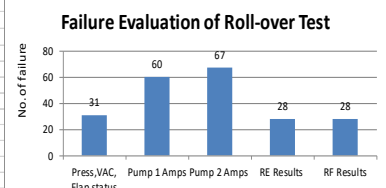
Formative Assessment

- Weekly presentation of their findings
- Discussion, reflection and further analysis
- Using A3 format report, an industrial reporting method to present their findings
- Use the plan-Do-Check-Act approach to structure their investigation



Summative Assessment-Part One

- Final group presentation include analysis and results on the problem
- Present to the industrial partner
- Answer questions to show their understanding and confidence about their work

0		Unipart A3 Report																						
Team: SWAT	Start Date: 11-Nov-14	TARGETS (Desired Situation) Investigate the failures causes of tanks failed during the time period from April 2014 to September 2014 on Helium and Rollover for AMLVH310																						
Team Leader: Osiqbodi	Consultant: Andy, Chris	PLAN 1) Analyse Helium Test for all Aston Martin tanks VH314, VH288, V213, VH310 2) Analyse Rollover Tests for all Aston Martin tanks VH314, VH288, V213, VH310 3) Analyse specific operator ID's depending on answers from Chris 4) Find out why 13 tank ID numbers are missing from Helium Test data VH310 5) Why tanks take more than one day to test 6) Prepare for Unipart presentation with Andy and Dr. Chris 7) Evaluated Helium and Rollover Tests for all Aston Martin Tanks 8) The results proved that Helium and Rollover are the key tests failing majority of the time																						
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Summative Assessment-Part Two

- Design an Individual research plan
- Pick one of the possible roots cause of the problem and design a research plan to investigate it further

MSc Detailed Project Proposal Form

Please type and fill in the following form and all fields. Once completed and reviewed by supervisors then submit an electronic copy to Coventry University (see details at the end of this form). Thankyou.

Details

Date		
Name (s)	Forename(s) (Given Name)	
Course no.	Course	
E-Mail	Mobile/ Contact No.	

First Supervisor

Project Details

General Subject Area

Keywords / Topic areas listed

(A broad topic area that defines the area of project and keywords that could be used in a search facility)

Project Title :

A proposed title of the project, succinct and clear as to the project undertaken.

Abstract/ Summary :

Please provide some background about the project, topic, company, situation and overall summary as to the nature of problem and what is required. Your aim must be clearly stated within this section (approx 500 words)

What is the key question the project attempts to answer?

These should be testable in some way. These should be the key focal points that the project is trying to determine. (Challenging views, practises, models, behaviour, adoption etc on areas such as : the nature of..., impact of..., the practicality of..., a hypothesis of..., inferences questioned, assumptions deliberated and tested, questions of comparisons and contrasts...,etc-)

Students Feedback on the Approach

Main challenge was sort the huge amount of data and to determine the root cause of the problem.

The project done with Unipart was very helpful, however after investing so much time in it we weren't marked for the actual work

Creating A3 reports and updating the status every week was really helpful for us. Usually each week one of us will be explaining the A3 report. This helped us to improve the presentation skills. This will create a mannerism to update the status of project in an official manner to my managers even now

The assessment method was excellent. All the tools namely A3 reports, final presentation and creating a research plan are very useful for my professional carrier

Students' Feedback on Industrial Exposure

With industrial exposure I was able to differentiate by theory and practical. The industrial visits help us compare other problem in the same way and help us to use the same approach for all the industrial problems.

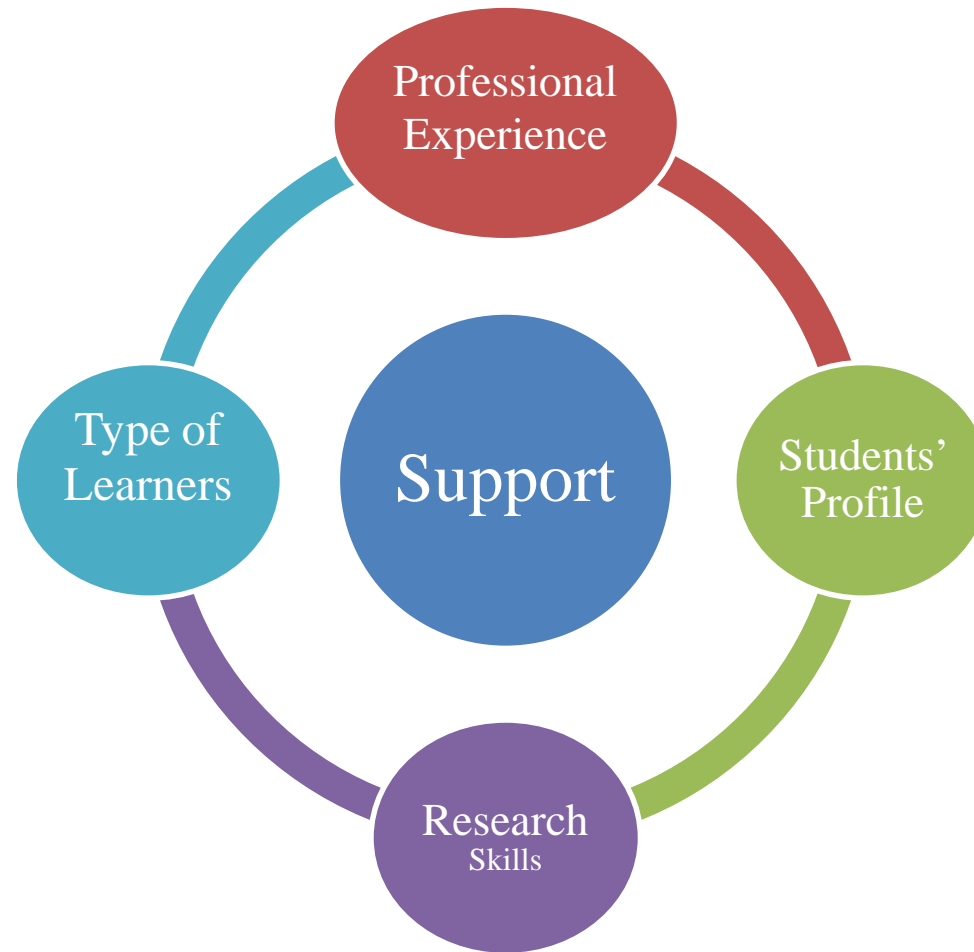
Applying all the contents in real projects during the time of study itself was really an awesome methods for students to understand this module in a better way

It helped me do more self-work and enhanced my analytical skills. It also gave me the knowledge of production processes of the product and how the data can be collected and interpreted to find solutions

The Industrial Partner Benefits

- Save time and cost investigating the problem
- Identify set of alternative solutions
- Identify the process critical parameters
- Identify better methods to collect and present data

Challenges to Overcome



Thank you for listening



**KEEP
CALM
AND
ASK
QUESTIONS**